AMENDMENTS TO CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A process for preparing a porous film, the process comprising the steps of:

forming a composite film onto at least a portion of a substrate wherein the composite film comprises at least one silicon-based structure-forming material and at least one pore-forming material, and wherein the composite film is substantially free of Si-OH bonds; and

exposing the composite film to at least one ultraviolet light source within a non-oxidizing atmosphere for a time sufficient to remove at least a portion of the at least one pore-forming material contained therein and provide the porous film~~, wherein the porous film is substantially free of Si-OH bonds~~.

2. (Currently Amended) The process of claim 1 further comprising treating the composite film with at least one additional energy source selected from the group consisting of a thermal energy, α-particles, β-particles, γ-rays, x-rays, ~~high energy electrons~~, electron beam, ultraviolet light, visible light, infrared light, microwave, radio-frequency wavelengths, and combinations thereof.

3. (Previously Presented) The process of claim 2 wherein the energy source is thermal energy.

4. (Previously Presented) The process of claim 1 wherein the ultraviolet light is comprised of at least one selected from the group consisting of dispersed, focused, continuous, intermittent, and combinations thereof.

5. (Original) The process of claim 1 wherein the ultraviolet light has one or more wavelengths of about 340 nm or below.

6. (Original) The process of claim 5 wherein the ultraviolet light has one or more wavelengths of about 280 nm or below.

7. (Original) The process of claim 6 wherein the ultraviolet light has one or more wavelengths of about 200 nm or below.

8. (Currently Amended) The process of claim 1 wherein the ultraviolet light is at least one selected from the group consisting of an excimer laser, a barrier discharge lamp, a mercury lamp, a microwave-generated UV lamp, a ~~picosecond or sub-picosecond~~ laser, a frequency doubled laser in the IR or visible region, a frequency tripled laser in the IR or visible region, a two-photon absorption from a laser in the visible region, and combinations thereof.

9. (Currently Amended) The process of claim 1 wherein the exposing step is conducted by employing a quartz vessel, a ~~modified~~ deposition chamber, a conveyor belt process system, ~~a hot plate,~~ a vacuum chamber, a cluster tool, a single wafer instrument, a batch processing instrument, a rotating turnstile, and combinations thereof.

10. (Original) The process of claim 1 wherein the at least one structure-forming material is at least one selected from the group consisting of undoped silica glass (SiO_2), silicon carbide (SiC), hydrogenated silicon carbide (Si:C:H), silicon oxynitride (Si:O:N), silicon nitride (Si:N), silicon carbonitride (Si:C:N), fluorosilicate glass (Si:O:F), organofluorosilicate glass (Si:O:C:H:F), organosilicate glass (Si:O:C:H), diamond-like carbon, borosilicate glass (Si:O:B:H), phosphorous doped borosilicate glass (Si:O:B:H:P), and combinations thereof.

11. (Previously Presented) The process of claim 1 wherein the at least one structure-forming material is represented by the formula $Si_vO_wC_xH_yF_z$ where v+w+x+y+z=100 atomic%, v is from 10 to 35 atomic%, w is from 10 to 65 atomic%, x is from 5 to 30 atomic%, y is from 10 to 50 atomic%, and z is from 0 to 15 atomic%.

12. (Currently Amended) The process of claim 1 wherein the at least one pore-forming material is selected from the group consisting of labile organic groups, solvents,

polymers, surfactants, dendrimers, hyper branched polymers, polyoxyalkylene compounds, hydrocarbon materials, and combinations thereof.

13. (Currently Amended) The process of claim 1 wherein the at least one pore-forming ~~precursor~~ material is selected from the group consisting of alpha-terpinene, limonene, cyclohexane, 1,2,4-trimethylcyclohexane, 1,5-dimethyl-1,5-cyclooctadiene, camphene, adamantane, 1,3-butadiene, substituted dienes, decahydronaphthelene, gamma-terpinene, alpha-pinene, beta-pinene, norbornadiene, and combinations thereof.

14. (Original) The process of claim 1 wherein the pore-former precursor and the structure-former precursor are the same compound.

15. (Original) The process of claim 1 wherein the forming step involves one or more processes selected from the group consisting of thermal chemical vapor deposition, plasma enhanced chemical vapor deposition, spin coating, dip coating, Langmuir-blodgett self assembly, misting, supercritical fluid deposition, cryogenic chemical vapor deposition, chemical assisted vapor deposition, hot-filament chemical vapor deposition, and combinations thereof.

16. (Original) The process of claim 1 wherein the exposing step is conducted during at least a portion of the forming step.

17. (Previously Presented) The process of claim 1 wherein the pores within the porous film have an average size of about 100 nanometers or less.

18. (Original) The process of claim 17 wherein the average size of the pores within the porous film is about 10 nanometers or less.

19. (Original) The process of claim 18 wherein the average size of the pores within the porous film is about 2 nanometers or less.

20. (Original) The process of claim 1 wherein the time of the exposing step is one hour or less.

21. (Original) The process of claim 20 wherein the time of the exposing step is ten minutes or less.

22. (Original) The process of claim 21 wherein the time of the exposing step is ten seconds or less.

23. (Original) The process of claim 1 wherein the at least one energy source is less than 1000 feet from the material to be exposed.

24. (Original) The process of claim 23 wherein the at least one energy source is less than 10 feet from the material to be exposed.

25. (Original) The process of claim 24 wherein the at least one energy source is less than 1 foot from the material to be exposed.

26. (Previously Presented) The process of claim 1 wherein the non-oxidizing atmosphere contains at least one gas selected from the group consisting of nitrogen, hydrogen, inert gases, and combinations thereof.

27. (Original) The process of claim 1 wherein the non-oxidizing atmosphere comprises a vacuum.

28. (Currently Amended) A process for preparing a porous film, the process comprising:

forming a composite film onto at least a portion of a substrate wherein the composite film comprises at least one silicon-based structure-forming material and at least one pore-forming material, and wherein the composite film is substantially free of Si-OH bonds;

exposing the composite film to at least one energy source comprising ultraviolet light within a non-oxidizing atmosphere for a time sufficient to remove at least a portion of the at least one pore-forming material contained therein ~~and~~ to

provide the porous film ~~wherein the porous film is substantially free of Si-OH bonds~~; and

treating the porous film with one or more second energy sources.

29. (Currently Amended) The process of claim 28 wherein the second energy source is at least one selected from the group consisting of thermal energy, α-particles, β-particles, γ-rays, x-rays, ~~high energy~~ ~~electrons~~, electron beam, ultraviolet light, visible light, infrared light, microwave, radio-frequency wavelengths, and combinations thereof.

30. (Canceled)

31. (Canceled)

32. (Original) The process of claim 28 wherein the treating step is conducted after the exposing step.

33. (Original) The process of claim 28 wherein the dielectric constant of the porous film after the exposing step is 2.7 or less.

34. (Original) The process of claim 28 wherein the dielectric constant of the porous film after the exposing step is 2.4 or less.

35. (Original) The process of claim 28 wherein the dielectric constant of the porous film after the exposing step is 2.2 or less.

36. (Canceled)

37. (Currently Amended) A process for preparing a porous film, the process comprising:

forming a composite film onto at least a portion of a substrate wherein the composite film comprises at least one silicon-based structure-forming material and at least one pore-forming material, and wherein the composite film is substantially free of Si-OH bonds; and

exposing the composite film to an ultraviolet light source within a non-oxidizing atmosphere for a time sufficient to remove at least a portion of the at least one pore-forming material contained therein ~~and~~ to provide the porous film wherein the density of the porous film is at least 10% less than the density of the composite film.

38. (Currently Amended) A process for preparing a porous film, the process comprising:

forming a composite film having a first density onto at least a portion of a substrate wherein the composite film comprises at least one silica-based structure-forming material and at least one pore-forming material, and wherein the composite film is substantially free of Si-OH bonds; and

exposing the composite film to an ultraviolet light source within a non-oxidizing atmosphere for a time sufficient to substantially remove the at least one pore-forming material contained therein ~~and~~ to provide the porous film having a second density wherein the second density is at least 10 percent less than the first density ~~and wherein the porous film is substantially free of Si-OH bonds~~.

39. (Original) The process of claim 38 wherein the second density is at least 25 percent less than the first density.

40. (Original) The process of claim 38 wherein the second density is at least 50 percent less than the first density.

41. (Original) The process of claim 38 wherein the porous film is substantially the same composition as the at least one structure-forming material.

42. (Currently Amended) A chemical vapor deposition method for producing a porous film represented by the formula $Si_vO_wC_xH_yF_z$, where v+w+x+y+z = 100 atomic%, v is from 10 to 35 atomic%, w is from 10 to 65 atomic%, x is from 5 to 30 atomic%, y is from 10 to 50 atomic%, and z is from 0 to 15 atomic%, the method comprising:

providing a substrate within a vacuum chamber;

introducing into the vacuum chamber gaseous reagents including at least one structure-forming precursor gas selected from the group consisting of an organosilane and

an organosiloxane, and a pore-former precursor distinct from the at least one structure-forming precursor;

applying energy to the gaseous reagents in the vacuum chamber to induce reaction of the precursors to deposit a composite film on the substrate, wherein the composite film comprises at least one structure-forming material and at least one pore-forming material, and wherein the composite film is substantially free of Si-OH bonds; and

exposing the composite film to an ultraviolet light source within a non-oxidizing atmosphere for a time sufficient to substantially remove the at least one pore-forming material contained therein ~~and~~ to provide the porous film comprising a plurality of pores and a dielectric constant of 2.7 or less ~~wherein the porous film is substantially free of Si-OH bonds~~.

43. (Previously Presented) The method of claim 42 wherein the structure-forming precursor gas is an organosilane comprising at least one member selected from the group consisting of methylsilane, dimethylsilane, trimethylsilane, tetramethylsilane, phenylsilane, methylphenylsilane, cyclohexylsilane, tert-butylsilane, ethylsilane, diethylsilane, tetraethoxysilane, dimethyldiethoxysilane, dimethyldimethoxysilane, dimethylethoxysilane, methyldiethoxysilane, triethoxysilane, trimethylphenoxysilane, phenoxysilane, diacetoxymethylsilane, methyltriethoxysilane, and di-tert-butylsilane.

44. (Previously Presented) The method of claim 42 wherein the structure-forming precursor gas is an organosiloxane comprising is at least one member selected from the group consisting of 1,3,5,7-tetramethylcyclotatrasiloxane, octamethylcyclotetrasiloxane, hexamethylcyclotrisiloxane, hexamethyldisiloxane, 1,1,2,2-tetramethyldisiloxane, and octamethyltrisiloxane.

45. (Currently Amended) The method of claim 42 wherein the pore-former ~~precursor~~ material is at least one member selected from the group consisting of alpha-terpinene, limonene, cyclohexane, 1,2,4-trimethylcyclohexane, 1,5-dimethyl-1,5-cyclooctadiene, camphene, adamantane, 1,3-butadiene, substituted dienes, gamma-terpinene, alpha-pinene, beta-pinene, norbornadiene, and decahydronaphthelene.

46. to 52. (Canceled)

53. (New) The process of claim 13 wherein the at least one pore-forming precursor is norbornadiene.

54. (New) The process of claim 45 wherein the at least one pore-forming precursor is norbornadiene.

55. (New) The process of claim 1 wherein the at least one pore-forming material is a cyclic hydrocarbon having a cyclic structure and the formula C_nH_{2n}, where n is 4 to 14, and the number of carbons in the cyclic structure is between 4 and 10.

56. (New) The process of claim 1 wherein the at least one pore-forming material is a linear or branched, saturated, singly or multiply unsaturated hydrocarbon of the general formula $C_nH_{(2n+2)-2y}$ where n is a number ranging from 2 to 20, and where y is a number ranging from 0 to n.

57. (New) The process of claim 1 wherein the at least one pore-forming material is a singly or multiply unsaturated cyclic hydrocarbon having a cyclic structure having the formula C_nH_{2n-2x}, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the cyclic hydrocarbon ranges from 4 to 10, and the at least one singly or multiply unsaturated cyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the cyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

58. (New) The process of claim 1 wherein the at least one pore-forming material is a one bicyclic hydrocarbon having a bicyclic structure having the formula C_nH_{2n-2}, where n is a number ranging from 4 to 14, wherein the number of carbons in the bicyclic hydrocarbon structure ranges from 4 to 12, and the at least one bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the bicyclic structure.

59. (New) The process of claim 1 wherein the at least one pore-forming material is a multiply unsaturated bicyclic hydrocarbon having a bicyclic structure and the formula $C_nH_{2n-(2+2x)}$, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the multiply unsaturated bicyclic hydrocarbon structure is from 4 to 12, and the at least one multiply unsaturated bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the bicyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

60. (New) The process of claim 1 wherein the at least one pore-forming material is a tricyclic hydrocarbon having a tricyclic structure and the formula C_nH_{2n-4}, where n is a number ranging from 4 to 14, wherein the number of carbons in the tricyclic structure ranges from 4 to 12, and the at least one tricyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the cyclic structure.

61. (New) The process of claim 42 wherein the at least one pore-forming precursor is a cyclic hydrocarbon having a cyclic structure and the formula C_nH_{2n}, where n is 4 to 14, and the number of carbons in the cyclic structure is between 4 and 10.

62. (New) The process of claim 42 wherein the at least one pore-forming precursor is a linear or branched, saturated, singly or multiply unsaturated hydrocarbon of the general formula $C_nH_{(2n+2)-2y}$ where n is a number ranging from 2 to 20, and where y is a number ranging from 0 to n.

63. (New) The process of claim 42 wherein the at least one pore-forming precursor is a singly or multiply unsaturated cyclic hydrocarbon having a cyclic structure having the formula C_nH_{2n-2x}, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the cyclic hydrocarbon ranges from 4 to 10, and the at least one singly or multiply unsaturated cyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the cyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

64. (New) The process of claim 42 wherein the at least one pore-forming precursor is a one bicyclic hydrocarbon having a bicyclic structure having the formula C_nH_{2n-2}, where n is a number ranging from 4 to 14, wherein the number of carbons in the bicyclic hydrocarbon structure ranges from 4 to 12, and the at least one bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the bicyclic structure.

65. (New) The process of claim 42 wherein the at least one pore-forming precursor is a multiply unsaturated bicyclic hydrocarbon having a bicyclic structure and the formula $C_nH_{2n-(2+2x)}$, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the multiply unsaturated bicyclic hydrocarbon structure is from 4 to 12, and the at least one multiply unsaturated bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the bicyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

66. (New) The process of claim 42 wherein the at least one pore-forming precursor is a tricyclic hydrocarbon having a tricyclic structure and the formula C_nH_{2n-4}, where n is a number ranging from 4 to 14, wherein the number of carbons in the tricyclic structure ranges from 4 to 12, and the at least one tricyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the cyclic structure.

67. (New) The process of claim 28 wherein the at least one pore-forming material is a cyclic hydrocarbon having a cyclic structure and the formula C_nH_{2n}, where n is 4 to 14, and the number of carbons in the cyclic structure is between 4 and 10.

68. (New) The process of claim 28 wherein the at least one pore-forming material is a linear or branched, saturated, singly or multiply unsaturated hydrocarbon of the general formula $C_nH_{(2n+2)-2y}$ where n is a number ranging from 2 to 20, and where y is a number ranging from 0 to n.

69. (New) The process of claim 28 wherein the at least one pore-forming material is a singly or multiply unsaturated cyclic hydrocarbon having a cyclic structure having the

formula C_nH_{2n-2x}, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the cyclic hydrocarbon ranges from 4 to 10, and the at least one singly or multiply unsaturated cyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the cyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

70. (New) The process of claim 28 wherein the at least one pore-forming material is a one bicyclic hydrocarbon having a bicyclic structure having the formula C_nH_{2n-2}, where n is a number ranging from 4 to 14, wherein the number of carbons in the bicyclic hydrocarbon structure ranges from 4 to 12, and the at least one bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the bicyclic structure.

71. (New) The process of claim 28 wherein the at least one pore-forming material is a multiply unsaturated bicyclic hydrocarbon having a bicyclic structure and the formula $C_nH_{2n-(2+2x)}$, where x is a number of unsaturated sites, n is a number ranging from 4 to 14, wherein the number of carbons in the multiply unsaturated bicyclic hydrocarbon structure is from 4 to 12, and the at least one multiply unsaturated bicyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituents substituted onto the bicyclic structure, and contains endocyclic unsaturation or unsaturation on one of the hydrocarbon substituents.

72. (New) The process of claim 28 wherein the at least one pore-forming material is a tricyclic hydrocarbon having a tricyclic structure and the formula C_nH_{2n-4}, where n is a number ranging from 4 to 14, wherein the number of carbons in the tricyclic structure ranges from 4 to 12, and the at least one tricyclic hydrocarbon optionally contains a plurality of simple or branched hydrocarbons substituted onto the cyclic structure.